ZINGIBERACEAE IN NEW ZEALAND

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Abstract. The two species of Zingiberaceae adventive in New Zealand are *Hedychium coronarium* var. *subditum* (Turrill) Naik and *H. gardnerianum* Roscoe. They are described and their history of introduction, present distribution, means of dispersal and nomenclature discussed. Other species of Zingiberaceae known to be in cultivation in New Zealand are listed.

Species of the Indo-malaysian family Zingiberaceae have been grown in New Zealand since at least 1865. Ludlam (1869) in an essay written for the 1865 Dunedin Exhibition stated that *Hedychium* ("Hodychium") *gardnerianum* and *H. coronarium* "have grown and bloomed here [Lower Hutt] for several years". Mason (1897) recorded that *Hedychium speciosum* was growing at Taita at that time. Mason's record is interesting since this is the only report of this species in New Zealand (at least until 1972, see list below), but as *H. speciosum* has in the past been confused with *H. gardnerianum*, it may have been the latter that Mason meant.

A search of old nursery catalogues and gardening journals in the Auckland Institute and Museum library showed that it was not until the mid-1950s that species of *Hedychium* were regularly offered to the public. Cheeseman (1925) did not include the genus in his list of naturalized plants, although Allan (1940), only 15 years later, mentioned that *H. gardnerianum* was escaping in North Island. The N.Z. Weed & Pest Control Society (1969) listed both *H. gardnerianum* and *"H. oblongum"* (= *H. coronarium* var. *subditum*, see below) as naturalized in New Zealand.

The two species have very similar ranges in the North Island, but only *H. gardnerianum* is known to escape in the South Island. They can easily be distinguished, as follows.

H. coronarium var. *subditum*	*H. gardnerianum*
Leaves lanceolate, 40-55 × 8.5 - 10cm, softly pilose on lower surface.	Leaves ovate, (20-) 30 - 45 × (10-)11 - 14 cm, glabrous.
Spike strobiloid, bracts erect, concealing axis.	Spike lax, bracts spreading, axis revealed between bracts.
Filament white to cream, about as long as lip.	Filament bright red, about twice as long as lip.
Perianth white to pale cream.	Perianth yellow.
Lip (3.0-)3.5 - 4.5 × 2.5 - 3.0cm	Lip 2.5 - 3.0 × 1.7 - 2.0cm.

Hedychium coronarium Koenig var. **subditum** (Turrill) Naik, in Naik & Panigrahi, Bull. Bot. Surv. India 3 (1961) 71. (Figs. 1-4)

Hedychium subditum Turrill, Kew Bull. (1914)370.

Hedychium flavum Roscoe, Pl. Monandr. Scit. (1828)t.49, non *H. flavum* Roxb.

Plant 2 - 3m tall, spreading vegetatively by thick fleshy rhizomes. Leaves lanceolate to linear-lanceolate, 40 - 55cm long, 8.5 - 10cm wide, acute to attenuate at tip, ligule oblong, 3.5 - 5.0cm long, 2.0 - 2.5cm wide, often reddish, finally membranous.

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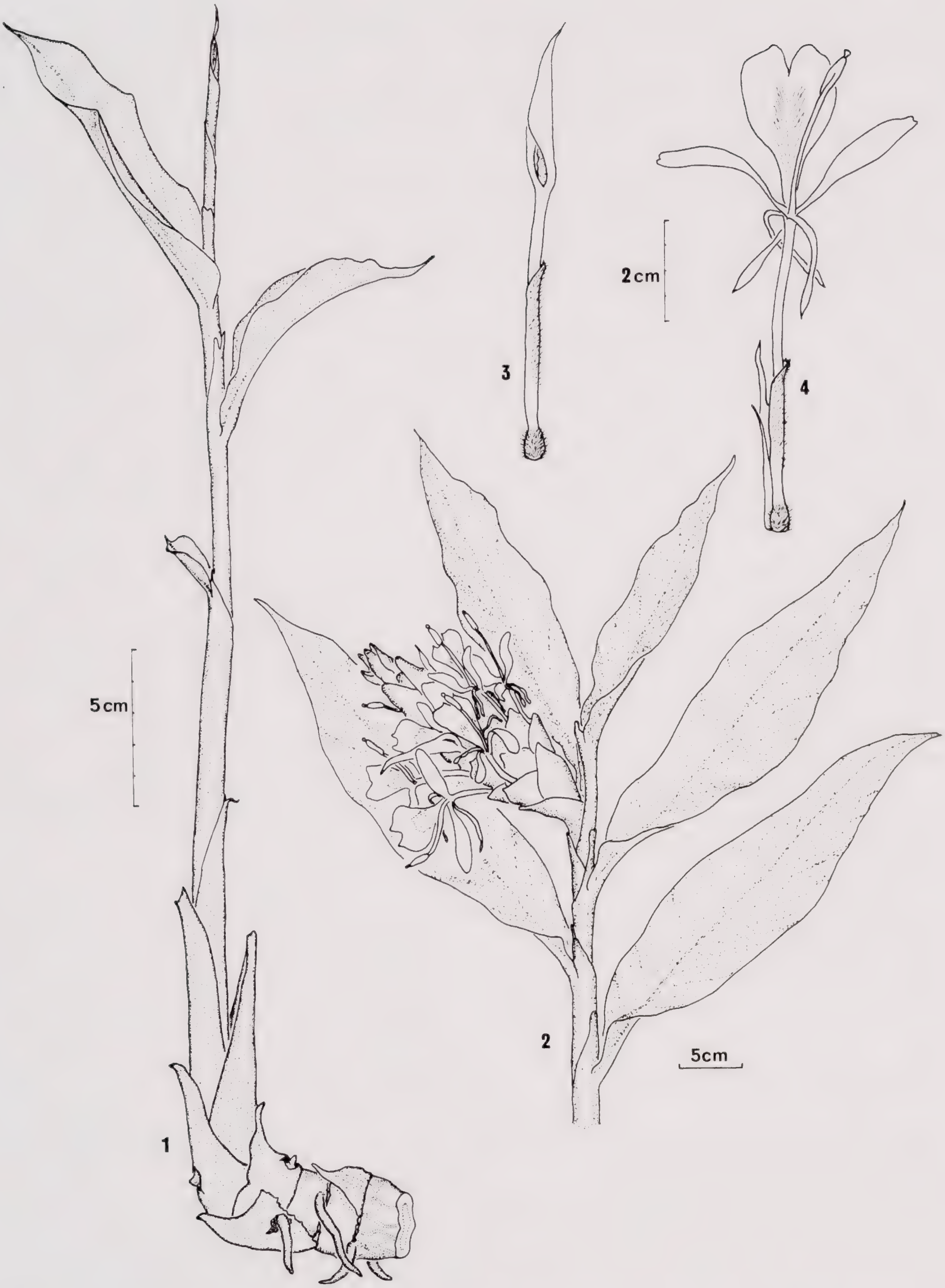


Figs. 1-4. *Hedychium coronarium* var. *subditum*. 1. Portion of rhizome and new shoot. 2. Inflorescence. 3. Bud. 4. Flower and two buds from axil of a single bract. (All A. E. Orchard 3361).

Inflorescence a terminal, strobiloid spike, often set at an angle to axis. Bracts erect, imbricate, concealing axis, broadly ovate to oblong, (3.0-)3.5 - 5.0cm long, 2.0 - 3.0cm wide, obtuse, margin membranous, fimbriate. Flowers 3 per bract, each subtended by a membranous, hyaline secondary bract, 2.0 - 2.5cm long. Calyx white to cream, tubular, oblique, (2.5-)3.5 - 4.0cm long, 4.0mm diam., minutely 3-toothed at apex, slit for $\frac{1}{3}$ of length, pilose, approx. $\frac{1}{2}$ length of floral tube. Floral tube 6.5 - 7.5cm long, 3.0mm diam., yellowish. Perianth segments 3, yellow-green, narrowly oblanceolate, 3.0 - 3.8cm long, 0.3 - 0.5cm wide, acute. Lateral staminodes 2, white to cream, oblanceolate, 3.5 - 4.3cm long, (0.6-)0.8 - 1.3cm wide, obtuse or slightly bilobed. Lip white to cream, often with yellow patch near base, obcordate, (3.0-)3.5 - 4.5cm long,2.5 - 3.0cm wide, shortly unguiculate, bilobed, with sinus 3.0 - 7.0mm deep. Stamen ± equal to or slightly exceeding lip, filament (2.5-)3.5cm long, white to cream, anthers 1.3 - 1.5cm long. Ovary barrel-shaped, 3.0 - 4.0mm long, 3.0mm diam., 3-locular, densely appressed pilose. Style and stigma green, protruding at apex of anther lobes. Fruit not observed.

DISTRIBUTION. *H. coronarium* ranges widely throughout North Auckland province, particularly along the eastern coast, and is also found on the western side of Coromandel Peninsula (Fig. 5). It has been reported from as far south as Kawhia Harbour, but this record is not yet supported by collections.

Specimens examined. North Island: Adams s.n., Hape Stream, Thames, CHR 143560; Blick s.n., 26.vi.1971, Warkworth, CHR 72013; Braggins s.n., 16.v.1973 Haruru Falls, ca 3.5km west of Paihia, AK 132557; Esler & Astridge 4030, 12.vi.1972, "Bankside", Silverdale, AK, CHR; Esler & Astridge 4036, 11.v.1972, Alberon Park, Parnell, CHR; Fox s.n., 29.iv.1969, Domain pond, Auckland, AK 132552; Fox s.n., 4.v.1972, cultivated in Auckland Domain, AK 132555; Goodey s.n., 9.v.1969, cultivated Parnell, AK 120555; Goodey s.n., 21.iv.1972, cultivated Parnell, AK 129656, 129657; Halliday 3, 24.ii.1973, *ca.* 2km north of Towai, on road to Kawakawa, AK; Halliday 10, 24.ii.1973, *ca.* 13.5km south of Kaeo on Highway 10, AK; Halliday 11, 24.ii.1973, *ca.* 3km south-east of Kaeo on Highway 10, AK; Halliday 13, 24.ii.1973, *ca.* 8km north-west of Kaeo on road to Tauranga Bay, AK; Halliday 19, 24.ii. 1973, 1km north-west of Ohaeawai, AK; Mason, Cooper & Moar s.n., 2.xii.1949, roadside near Kaeo, AK 35831; Mason & Moar 333, 2.ii.1949, Kaeo, CHR; Orchard 3278, 21.iv.1972, Piha beach, AK; Orchard 3361, 4.vi.1972, *ca.* 2.5km west of Wenderholm turnoff on Highway 1, AK; Orchard 3363, 4.vi.1972, Highway 1, at Wenderholm turnoff, AK; Orchard 3656, 15.x.1972, northern landing of Rawene ferry, Hokianga Harbour, AK; Orchard 3937, 10.iii.1973, Coromandel township, in waste ground near the wharf, AK; Orchard 3963, 14.iv.1973, *ca.* 5km south-west of Leigh on road to Warkworth, AK; Reynolds s.n., 15.iii. 1972, Anzac Rd, Whangarei, PDD-B; Wood s.n., 30.iv.1972, near the bridge at Huia, AK, PDD-B.

The cultivated forms of this variety were treated under the name *Hedychium flavum* Roxb. until Turrill (1914) pointed out that this name was wrongly applied and proposed the substitute *H. subditum*. However, this change was overlooked in New Zealand, and the name *H. flavum* has continued to be used until very recently, particularly for the forms of *H. coronarium* in which the lip is cream or white with a basal yellow patch (eg. Matthews & Matthews, 1960). Forms of this variety with pure white flowers have tended to be called *H. coronarium* (Matthews & Matthews, 1960; Harrison, 1963; Harrison & Harrison, 1967).

Naik & Panigrahi (1961), on the basis of further collections from Eastern India, pointed out that many of the previously described species related to *H. coronarium* were connected to it by extensive ranges of intermediates in this area. They therefore reduced many of these species (including *H. subditum)* to the rank of varieties of *H. coronarium*. Recently the N.Z. Weed & Pest Control Society (1969) suggested the name *H. oblongum* K.Schum. for the New Zealand species. However *H. oblongum* is described as having a glabrous ovary, a longer calyx, and much smaller lip and stamen filament than *H. coronarium.* Only one collection from New Zealand (Blick, CHR 72013) comes close to *H. oblongum* in flower size, but has a pilose ovary and is here considered only a depauperate form of *H. coronarium* var. *subditum.*

As this species does not set seed in New Zealand it can only spread by means of its thick fleshy rhizomes, or by human agencies. That the latter can easily account for the present distribution of the species is shown, for example, by Halliday 10, which was collected from a small but flourishing clump of *H. coronarium* var. *subditum,* growing many kilometres from the next population, but in association with *Agapanthus, Crocosmia, Watsonia* and other hardy garden species amongst gorse, about 50 metres from the side of a main road.

Hedychium gardnerianum Roscoe, Pl. Mondandr. Scit. (1828) t. 62. (Figs. 6-11)

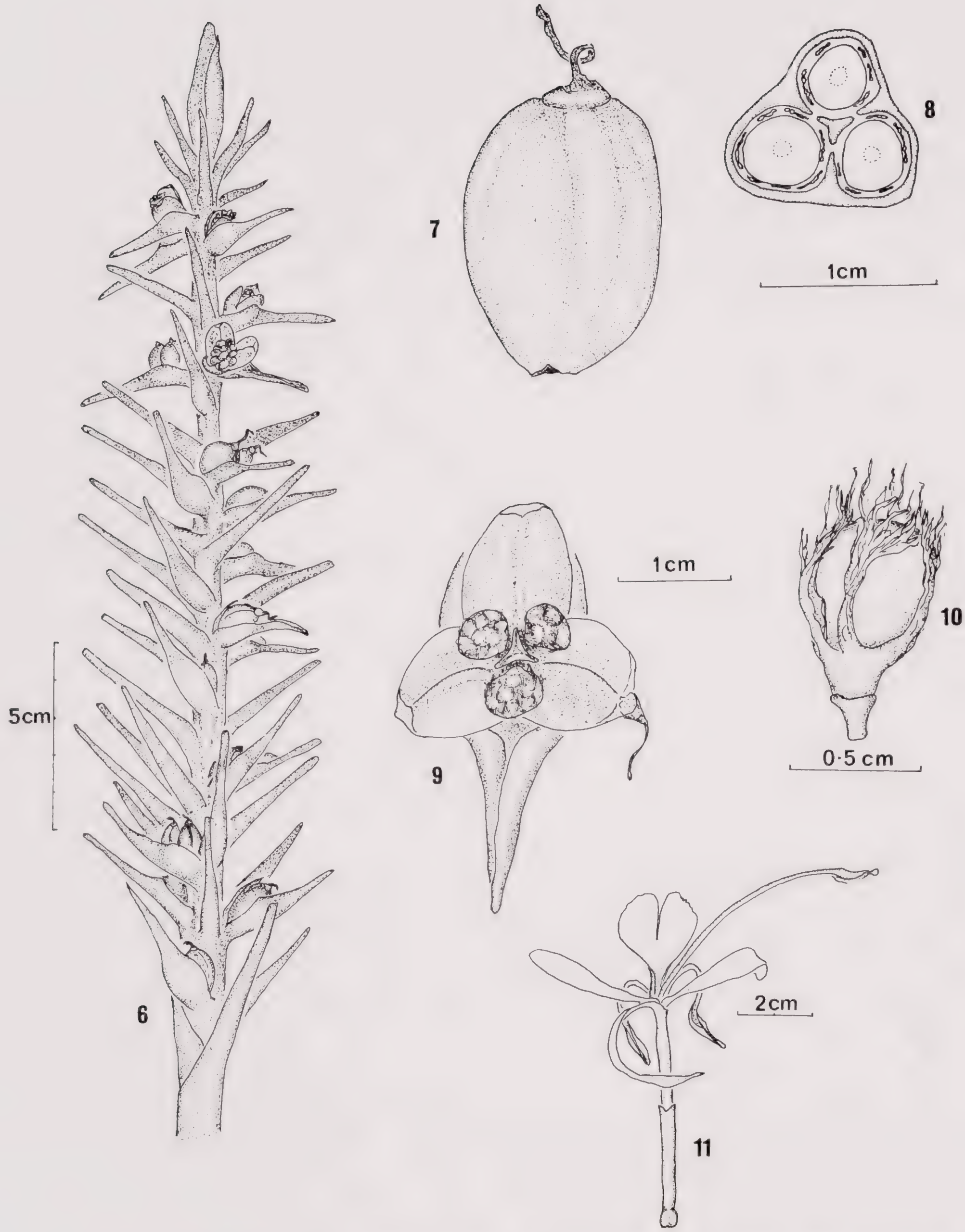
Plant ½-2m tall, spreading vegetatively by thick fleshy rhizomes. Leaves narrow-ovate to ovate (20-)30-45cm long, (10-)11-14cm wide, apex acute to acuminate, sub-glaucous on lower surface, glabrous, ligule ovate to oblong, 2-3cm long, 2-3cm wide, blunt, finally membranous.

Inflorescence a terminal, lax spike, often at an angle to axis. Bracts green, spreading, tightly rolled, revealing axis, 3.3-4.0cm long, *ca* 1.5-1.7cm wide, apex obtuse, margin membranous, glabrous. Flowers 2 per bract, each subtended by a hyaline, membranous, secondary bract, *ca.* 2cm long. Calyx yellow, tubular, 2.0-3.3cm long, 0.3-0.4cm diam., oblique, minutely 3-toothed at apex, slit to depth of 4.0-5.0mm, sparse tuft of hairs on tips of teeth. Floral tube yellow, 4.5-5.0cm long, 0.3cm diam. Perianth segments 3, yellow-green, linear to narrow-oblanceolate, 3.0-3.5cm long, 2.0-3.0mm wide. Lateral staminodes 2, yellow, oblanceolate, 2.5-3.3cm long, 0.5-0.7cm wide, blunt. Lip yellow, sometimes slightly flushed orange at base, ovate to obovate, 2.5-3.0cm long, 1.7-2.0cm wide, unguiculate, bilobed, sinus 0.5-0.6cm deep, sometimes with small apiculus at base. Stamen much exceeding lip; filament bright red, 5.0-6.0cm long, anthers 0.8-1.0cm long. Style and stigma greenish, protruding beyond anthers. Ovary ± globose to barrel-shaped, 3.0mm long, 3.0mm diam., weakly longitudinally ribbed, glabrous, 3-locular.

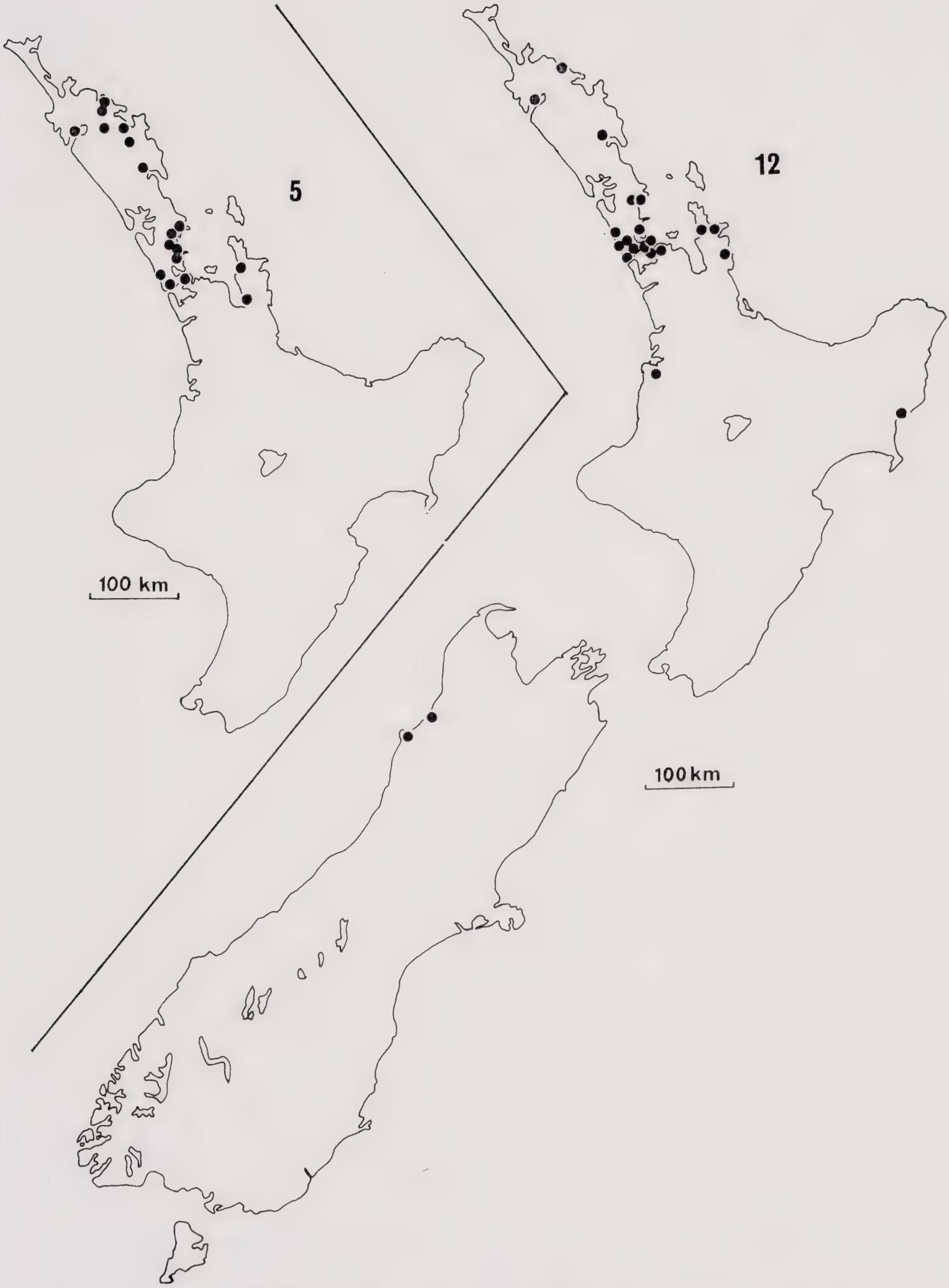
Fruit usually 1, rarely 2, per bract, ovoid, 1.0-1.5cm long, 1.0-1.5cm diam., 3-lobed, crowned by persistent floral tube, loculicidal, yellow-orange, seeds numerous, dark red, surrounded by fimbriate scarlet aril.

DISTRIBUTION. This species has a range very similar to that of *H. coronarium* in the North Island, and is also known from near Westport in the South Island (Fig. 12).

Specimens examined. North Island. Braggins s.n., 3.iii.1973, south edge of Kawhia Harbour, along Oreke Creek, just south of Kinohaka, AK 132561; Chamberlain s.n., 2.vii.1952, Gisborne, CHR 82061; Edgar & Astridge s.n., 12.x.1972, Auckland, West Coast Rd, near Kauri Rd, CHR 224789; Fox s.n., 4.v.1972, cultivated Auckland Domain, AK 132559; Haddow s.n., 27.viii.1970, Waitakere Ranges, AK 126463; Halliday 1, 31.i.1973, Piha, near track to Glen Ness falls, AK; Halliday 2, 24.ii.1973, Sandspit, AK; Halliday 12, 24.ii.1973, *ca.* 8km north-west of Kaeo, on road to Tauranga Bay, AK; Halliday 18, 24.ii.1973, *ca.* 2km north of Kohukohu, AK; Halliday 20, 7.iii.1973, roadside near Long Bay, AK; Hodgkins s.n., Auckland, CHR 3034; Lloyd s.n., 20.vii.1949, Onehunga, AK 25040; Orchard 3302, 25.iv.1972, Maraetai-Whitford road near turnoff to Kelly's Beach, AK; Orchard 3303, 29.iv.1972, Ladies Point, St Heliers, AK; Orchard 3370, 1.vii.1972, Mountain Road, *ca.* 5.5km west of Oratia, AK; Orchard 3371, 1.vii.1972, Scenic Drive, *ca.* 2.5km west of Titirangi, AK; Orchard 3392, 26.vii.1972, Winstone Track, Piha Valley, AK; Orchard 3932, 25.ii.1973, *ca.* 5km north-west of Warkworth on Highway 1, AK; Orchard 3933, 27.ii.1973, Muriwai Beach, AK; Orchard 3936, 27.ii.1973, *ca.* 8km north-east of Muriwai Beach, AK; Orchard 3937, 10.iii.1973, Coromandel, near the wharf, AK; Orchard 3955, 10.iii.1973, Coro-



Figs. 6-11. *Hedychium gardnerianum*. 6. Infructescence with mature and immature fruits. 7. Fruit just before splitting. 8. Transverse section of fruit. 9. Bract and open fruit, seen from above. 10. Seed, surrounded by aril. 11. Flower. (Figs. 6 - 10. A. E. Orchard 3370. Fig. 11. T. A. Halliday 1.).



Figs. 5, 12. Distribution in New Zealand. 5. *Hedychium coronarium var subditum.* 12. *Hedychium gardnerianum.*

mandel-Whitianga road, near Te Rerenga, AK; Orchard 3960, 11.iii.1973, Tairua, AK; Reynolds s.n., 15.iii.1972, Whangarei, PDD - B; Wood s.n., 30.iv.1972, by the bridge at Huia, AK 132560; Wood 5419, 14.iv.1951, bank of Huia Stream, AK. South Island : Mason & Moar 2351, 7.ii.1953, Westport, east side of Buller River, CHR; Mason & Moar 2360, 9.ii.1953, Granity, Buller Co., CHR.

Although, like *H. coronarium,* this species owes much of its present distribution to the human propensity to dump garden rubbish on the sides of roads, it also has the advantage of setting viable seeds. These have been distributed widely, presumably by birds, and many of the existing populations have undoubtedly been established from seedlings. Chamberlain (CHR 82061) recorded that *H. gardnerianum* had "escaped over nearly 3 acres [1.2 hectares] of hillside" near Gisborne. In parts of the Waitakere Ranges, particularly near Piha, seedlings have even become established in relatively undisturbed broadleaf forest, and the species threatens to become a serious weed. This has happened elsewhere, as for example, in the Azores. It was introduced there between 1850 and 1875 and began spreading almost immediately. Rock pigeons carried seeds to all of the outlying islands, where it became established in all types of soils. In better soils "the rotstocks become so thick and strong that they invade and slowly kill whole woods of well grown pines, *Acacia melanoxylon,* etc, if they happen to be in its way . . . Before the last War, I was told that the conservative value of the land overrun by Hedychium should be put at between 25 and 35 million pounds gold." (quoted in Roper, 1960).

Naik & Panigrahi (1961) following Baker (1892) recognise two varieties in this species, separated on flower colour and the depth of the sinus of the lip, var. *gardnerianum* having lemon-yellow flowers and an entire or emarginate lip, var. *pallidum* having pale yellow flowers and a distinctly bifid lip. The New Zealand plants vary in both these characteristics, and there seems little point in distinguishing varieties here. However, if this is deemed necessary, then most plants are closest to *H. gardnerianum* var. *pallidum* (Regel) Baker.

SPECIES IN CULTIVATION.

As well as the above two taxa there are a number of other species in cultivation in New Zealand. The following list, while not claimed to be exhaustive, probably contains most of those commonly grown.

Alpinia speciosa (Wendl.) K. Schumann — growing in private Auckland gardens; flowering in May.

Brachychilus horsfieldii (R. Br.) G. O. Peters — ephiphyte, grown in Auckland as a geophyte; flowering in April, fruiting from May to August.

Curcuma roscoeana Wall. — a plant is growing at the Botany Department, University of Auckland, under this name but has not yet flowered; identification tentative.

Hedychium coronarium var. *maximum* (Rosc.) Baker — a flower collected from a garden in Mt Albert Road, Auckland (Esler s.n.,21.iii.1972,PDD - B) is very much larger than is normal for var. *subditum,* and comes closest to the above variety. It has a calyx 3.5cm long, floral tube 7cm long, perianth lobes 3.5 x 0.5cm, staminodes 5.0 x 2.3cm, lip 5.0 x 4.7cm, filament 3.5cm, and was apparently pure white, with a flush of yellow on the lower part of the lip.

Hedychium densiflorum Wall.—Seedlings are growing at the Botany Department, University of Auckland under this name, but have not yet flowered; identification tentative.

Hedychium gracile Roxb. — growing at the Botany Department, University of Auckland and in a private garden, Auckland. The plants in New Zealand come closer to Schumann's description of *H. glaucum* Roscoe than to *H. gracile,* but Rao & Verma (1969) considered these two conspecific on the basis of intermediate populations found in the Jaintia Hills, Assam. This species flowers in Auckland in April.

Hedychium greenii Smith — growing at the Botany Department, University of Auckland, and in private gardens in Auckland; flowers from April to May.

Hedychium luteum Baker — this species, grown at the Botany Department, University of Auckland and in some private gardens in Auckland under the name *H. coccineum* var. *carneum,* matches Schumann's description (1904) of *H. luteum* much better. Schumann described the plant from specimens formerly cultivated in Berlin. However, Naik & Panigrahi (1961) stated that the only true specimen of *H. luteum* that they knew of was the type, and this was, in their opinion, only a form of the variable *H. coronarium.* The plants in cultivation in New Zealand, and the plant described by Schumann, are very different from *H. coronarium* in flower size and colour, leaf proportion and indumentum, relative lengths of the stamen and lip, and in spike structure.

Hedychium speciosum Wall. — the Botany Department, University of Auckland has two seedlings under this name, but they have not yet flowered; identification tentative.

Hedychium venustum Wight — the Botany Department, University of Auckland has a plant under this name, but it has not yet flowered; identification tentative.

Hedychium sp. — a specimen of *Hedychium* from a roadside clump, *ca.* 1 mile (1.6km) from Kaiwaka on the road to Mangawhai (M. Goodey s.n., 27.ii.1972, CHR 227581) does not seem to match any published description. It has broad glabrous leaves and a lax spike as in *H. gardnerianum,* but cream flowers borne in 3's, the filament scarlet-orange and much exceeding the lip. The flowers are larger than *H. gardnerianum* in most respects. The plant has been tentatively identified as a cream-flowered cultivar of *H. coccineum* var. *carneum.*

Roscoea cautleoides Gagnepain — grown at Prebbleton, Canterbury; flowering in November.

Zingiber officinale Roscoe — occasionally grown as a curiosity in Auckland, but it does not flower here.

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